



THE LIFETIME SURVEILLANCE OF ASTRONAUT HEALTH

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An Overview of the New Occupational Surveillance Program for the Astronaut Corps

BY: HEATHER J. HARTNETT, PhD

In 1992, the Longitudinal Study of Astronaut Health (LSAH) began to investigate the incidence of acute and chronic morbidity and mortality of astronauts to determine whether the unique occupational exposures encountered by astronauts are associated with increased risks of total or cause-specific morbidity and mortality. Since March 2008, meetings have been held to discuss the status of this program. These meetings reviewed the recommendations of the Institute of Medicine (IOM) to create an occupational surveillance program for the astronauts. Recently, the decision was reached to transform the LSAH into an occupational surveillance program. The acronym "LSAH" will now represent this new program, the Lifetime Surveillance of Astronaut Health.

The National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) define occupational surveillance as tracking of injuries, disease, hazards and exposures related to a job or career. This practice includes improving workers' health, and safety by meticulously collecting, analyzing, and interpreting the medical data. The program will involve both population-based and individual-based activities.

This program, beginning this summer, will screen and monitor astronauts for occupationally related disease. This will allow for a systematic evaluation of astronauts to detect potential health problems at an early state and to facilitate action to prevent the development or progression of occupationally related diseases.

This program is designed to fit the medical follow-up care to the individual, since everyone in this population has not been exposed equally to all hazardous chemicals and elements. Initially, medical data and work exposure history, such as space flight exposures and pilot or passenger aircraft hours, will be collected to compile a list of type and timing of all exposures. These measures will allow for individually tailored follow-up medical examinations to track this population more rigorously and capture medical events in sub-clinical or early stages. To begin this process, an occupational history questionnaire will be completed, and clinical practice guidelines to monitor specific exposures will be used to guide medical exams for the astronaut corp, both active and inactive. This addresses the goal of providing comprehensive astronaut health care by capturing all aspects of an astronaut's lifetime exposures.

To support this program, all astronauts will have medical testing. Upon selection into the astronaut corps, rigorous medical testing will begin and continue throughout the lifetime of the astronauts. A comprehensive annual medical examination will be performed on all astronauts, according to their occupational exposures and ages.

Why is this program being done?

The purpose of this program is to document and conduct occupational surveillance on astronauts throughout their lives. This begins with selection into the astronaut corps, throughout space flight, and into retirement. This will require in-depth data collection at selection about previous exposures before entering

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LSAH Repository Participation for Astronauts

BY: E. AMIRIAN, PhD, MSPH

Now more than ever before, scientific knowledge is being compiled at an astonishing rate. Participating in medical and epidemiological research can be an important way to contribute to the progression of science. Every day holds the promise of a new discovery that may shift the way we perceive ourselves and our universe and may open doors for exploration into topics never before imagined. In keeping with this spirit, LSAH is launching a data “repository” or storage bank for the purpose of maintaining medical data for use in future research. Space travel and exploration are topics that will be of interest for generations to come. Studying clinical and research data is vitally important to ensuring that future missions can be conducted without sacrificing human health and safety. The LSAH Repository can be a valuable resource to the future of human space exploration.

The repository will archive data from U.S. astronauts for use in approved future space flight-related research that is directly associated with the NASA mission. The data collected and stored will include preflight, postflight, and clinical visit information collected during active career and post-retirement. These data will be kept in secure databases that will be managed by LSAH Repository personnel. All U.S. astronauts are eligible to participate by providing consent for their medical data to be archived. Participation is voluntary, and astronauts may withdraw from the project at any time for any reason without consequence.

The research studies using the data maintained in the repository will undergo a strict approval process to ensure both the protection of the astronauts’ information and the scientific merit of the proposed project. Astronauts have a choice about if and how their personally identifying information (PII) will be used in approved research protocols. There are two different options astronauts may choose from to control how their data will be used. One option is for the astronaut to consent to the use of

their data for approved research projects without requiring any further contact or consent. This option maximizes the amount of data that is available for use in approved research. The second option requires that the astronaut’s consent be obtained every time their data are released. So, the astronaut will be contacted first and have the opportunity to give (or deny) consent before the release of data occurs. Regardless of which option the astronaut chooses, only information that is necessary to address approved, specific research objectives will be released. Alternatively, the astronaut may completely decline to participate in the repository, as participation is voluntary.

For some studies, PII may be necessary to conduct the research analyses. However, such information will not be published or released to the general public in a way that would allow the participant to be identified. The LSAH staff is committed to protecting the privacy of the astronauts (NDP 1382.17H NASA Privacy Policy and NPR 1382.1 NASA Privacy Procedural Requirements) and making sure that these valuable data are maintained and used appropriately. All data, regardless of consent status, remains in NASA data stores for internal use. Per NASA retention schedules, astronaut medical records are considered permanent.

It is our hope that by archiving this information, we will be providing a major resource to those who seek to find innovative ways to identify, prevent, or treat space flight-related health conditions.

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Currently, this consenting process is underway. For more information, please refer to the LSAH Repository informed consent documents or feel free to contact the LSAH staff (JSC-lsah@mail.nasa.gov).

Getting More Juice from the Lemon: The Lean Process

BY: DAVID RUBIN

On July 3, 1860 a man named Lewis P. Chichester submitted a patent to the U.S. Patent and Trademark Office for a cast-iron lemon squeezer. The purpose of this patent, the first for a device of this type in America, was to “obtain a simple, economical and durable implement whereby lemons may be squeezed for domestic purposes with much less power and with far greater facility than by ordinary squeezers in general use [1].” Although the means to extract juice from a lemon already existed, Mr. Chichester recognized the current process at that time required excessive effort and could be improved upon. His idea was that by introducing a new tool, he could both simplify and make the juice extraction process more efficient. Over a century later, this same concept is being manifested within the Lean philosophy to increase productivity in all types of processes.

At its core, Lean focuses on increasing process efficiency and flow through a formalized set of analysis tools. These tools are used to identify three categories of activities: (1) value added, for which something of benefit is produced for the customer; (2) non-value added, which is required for the overall process, but produces nothing for the customer; and (3) waste, which is not required for the process to be successful and for which the customer receives nothing. The ideal goal of Lean is to eliminate all waste, reduce non-value added activities, and maximize value added work. In principle, it's a simple theory people use all the time. Lean simply provides the tools to make this process easier.

Mr. Chichester was faced with the process of producing lemon juice by cutting up lemons and mashing the pulp by squeezing the lemons in his hands. By applying Lean methodology to this problem, it becomes clear the value added activity (producing juice) can be maximized by introducing a new tool, introducing a more efficient step in the process and greatly reducing the amount of waste (squeezing lemons by hand) in the system. Of course, Mr. Chichester didn't use Lean to figure all this out, but he did use the same principles. Lean is not necessarily a new way of approaching a

problem, but it is a more formalized method, a handy bag of tools to use when analyzing a complex process where the solutions aren't as obvious as a new lemon juicer.

Lean is a way of identifying the components of a process, rating how well each benefits the overall system, and brainstorming ideas for improvement. Most importantly, Lean relies on the actual users of the process to become actively involved in this analysis. Giving a sense of ownership over the process to those using it allows for a more candid discussion of what works and what does not. There's a significant difference between workers being efficient at a process and workers using an efficient process. The methodology involved in the Lean process focuses directly on the transformation from the former to the latter.

In Lean analysis, there are two types of approaches: Kaizen and Value Stream Mappings. Kaizen events involve the investigation of a singular process, identification of what can be improved within that process, and the implementation of those changes, all by the conclusion of the event. The goal of a Kaizen is to be able to walk out of the last meeting with a more efficient process already in place. Value Stream Mapping (VSM) is a method used to physically identify the component parts of a particular process. The emphasis is primarily on understanding what makes up a process and determining possible areas of improvement to be either investigated at a future Kaizen or worked on as a separate project.

As part of the continuing effort to improve the JSC Clinic, certain areas have been identified for analysis using Lean principles. To date, the Lean process has been applied to two areas within the JSC Clinic: a Kaizen for patient scheduling and a VSM for patient flow through the Clinic during physicals. The main goals of the patient scheduling Kaizen were to simplify the scheduling process, reduce the number of no-show patients, increase patient on-time compliance for required exams and, in general, make the whole process easier for patients. The outcome

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Health and Safety Tips for Travelers

BY: JOCELYN MURRAY, MPH

Summer will soon be here. This is an excellent time of year to take advantage of school breaks and great weather by planning a fun-filled vacation. Millions of Americans travel both domestically and internationally each year. Unfortunately, many well deserved vacations and important business trips are interrupted by travel-related illnesses and other emergencies. When planning your next adventure away from home, consider the following health and safety tips to make your trip as enjoyable as possible.

Explore your destination. The U.S. Department of State (www.state.gov/travel) is the quintessential online resource for official information on travel health and safety recommendations, both domestic and international. A broad range of information is available for researching travel destinations, gathering information on required travel documents, and planning for travel emergencies. When traveling internationally, this site provides the option to receive e-mail travel warnings and alerts relevant to a specific country and to register the trip, which will enable officers from U.S. Embassies and Consulates to provide assistance in emergencies.

Designate a contact person. In case of emergency, a friend or family member should be able to contact you. Leave a detailed copy of your itinerary and other important documents with your contact person. In addition, write his or her contact information on your itinerary, store it in your mobile phone, add it to the Personal Data and Emergency Contact Information section of your passport, and/or add it to your State Department trip registration as referenced above.

Review your transportation guidelines. Security measures must evolve to meet the needs of the country. Therefore, it is best to review guidelines established by both the Transportation Security Administration and your individual transportation agency. Doing so will help reduce any unexpected delays, unnecessary fees, and unfortunate confiscation of personal possessions. Travelers with special needs should use this time to determine the

best methods to travel safely while accessing all required resources.

Check your health insurance coverage. Outside of the home area, insurance coverage varies according to the individual policy. Most insurers do not provide coverage outside of the U.S. Alternatively, short-term travel insurance policies are available for international coverage. For convenience, the State Department maintains a list of insurers on their website. Regardless of the specific policy, always carry your health insurance identification card as proof of insurance.

Maintain your general health routine. Illnesses that occur away from home are not necessarily travel-related. Therefore, following up on recommendations made by your personal physician(s) will help reduce the odds of illnesses occurring away from home. Always carry the contact information of your personal physician(s) and pharmacy in case of emergency.

Carry a sufficient supply of medication. Ideally, you should carry a sufficient supply of prescribed and over-the-counter medications to last throughout the trip. This may, however, be limited by the length of the trip and insurance policy provisions. So, begin by checking your policy limits. For longer trips, options to secure a sufficient supply of medication may include having your prescription filled using your insurer's mail order pharmacy service, which usually provides a 3-month medication supply delivered via postal service, or a vacation fill, which will allow an override of normal prescription refill provisions. With the vacation fill option, it is possible to have additional refills supplied during a single visit to the pharmacy. Allow ample time to investigate these options, as you may have to schedule an additional doctor's visit or wait for medications to be shipped to your home. Domestic pharmacies may be able to refill your current prescriptions while traveling, but international pharmacies will likely not offer the courtesy. If you will have prescriptions filled away from home, identify a convenient in-network pharmacy in advance of your trip. If all other options fail, it may be necessary to see a local provider while traveling and

Travel, continued from previous page

request a new prescription. Carrying either a health summary from your personal physician or the empty medication bottle with both the brand and generic names of the medication will help ensure a successful health care visit. The State Department provides lists of physicians and medical facilities on the websites of U.S. Embassies and Consulates. This information is usually located under the U.S. Citizens and Services section. When traveling, all medication should remain in the original container. Keep a small supply of medication in your personal carrying bag separate from the larger supply of medication that may be checked or out of your immediate presence while traveling. This precautionary measure will prevent missed doses if you become separated from your luggage. Remember to check medication guidelines for your transportation agency and municipalities included on your itinerary.

Get vaccinated. The Centers for Disease Control and Prevention (CDC, www.cdc.gov/travel) has a Travelers' Health page devoted to travelers' health topics and important travel notices. The CDC divides travel vaccines into three categories: routine, recommended, and required. Many diseases have a low occurrence in the U.S. because of the effectiveness of routine vaccinations. On the contrary, these diseases are still common in other parts of the world. Therefore, it is a good idea to maintain your personalized routine vaccination schedule with your personal physician. Recommended vaccinations help prevent travelers from contracting diseases that are common in other countries. Specific recommended vaccinations vary depending on your destination, plans to visit rural areas, season of the year, age, health status, and previous immunizations. Begin by selecting your destination on the CDC's Travelers' Health page. This will lead you to the recommended vaccinations as well as general information to help you prepare for your trip. Schedule an appointment for recommended vaccinations with your personal physician or with a travel medicine clinic at least 6 weeks before the trip. Finally, required vaccines are mandatory before admission into a country. Proof of immunization is often required. The per-

son authorized to provide the vaccination will supply the certificate of vaccination.

Check the weather. It's summer here, but it's winter there! Knowing the general weather conditions of your destination will serve as a guide when packing travel supplies. The Weather Channel (www.weather.com) is one of the many online resources that provides a variety of features to help you prepare for seasonal changes in the weather.

Dine safely. Many travel-related illnesses can be avoided by adopting selective dining habits and incorporating them into your routine dining habits. Only drink boiled water, beverages made with boiled water, or water that has been appropriately treated with either iodine or chlorine. This includes safer options such as bottled water, coffee, and bottled sodas. Ice should be made using boiled water, and dairy products should be pasteurized. Avoid raw fruits and vegetables unless you thoroughly wash and peel them yourself. All other food items should be well cooked and served hot. Although tempting, street vendors should be avoided. Whatever the summer holds, these tips will help ensure that you are well on your way to a safe and healthy adventure!

References

- [1] The Weather Channel [Internet]Atlanta, GA: The Weather Channel Interactive, Inc.; [c2010 4/9/2010]. Available from: <http://www.weather.com>.
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*New Occupational Surveillance, continued
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the corps and documentation of exposures during training and space flight. This information will enable flight medicine physicians to tailor a follow-up schedule to track these exposures and prevent future medical conditions and diseases. This information also will be used to better understand the effects of space flight on astronauts and enable new techniques to be developed to protect against future adverse exposures and events.

What will happen in this program?

Each astronaut will be asked to provide information about occupational exposures: before being selected into the astronaut corps and during space-flight. A follow-up regimen will be determined by the Space Medicine and LSAH program tailored to meet specific needs and exposures.

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mendations on how to improve the system including the transition from paper to digital versions of certain forms and a change in the way some of the physicals are scheduled. In addition, the Kaizen team identified a number of software applications that could greatly increase the efficiency of the scheduling process, involving features ranging from online scheduling to better tracking of the tests that should be ordered for each patient.

The patient flow VSM highlighted the pathways a patient takes through the Clinic and the associated exam and wait times. For each type of physical, each step taken by either the patient or the clinic staff was identified and rated according to its value. From this rating, a plan was developed, listing all areas that can be improved and possible ways to make those improvements. It is in the best interest of both the

patient and the clinic staff to minimize wait times and expedite the flow through the physical exams; this event identified many of the obstacles to that goal and methods to improve them.

In the coming months, the Lean process will be used to analyze even more aspects of the Occupational Medicine and Occupational Health programs present at JSC. These two programs provide a wealth of services to a large number of people and, through the hard work of a very capable staff, these services will become even more efficient and valuable to those they serve.

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Reference:

[1]. U.S. Patent N0. 28967

Trusko, BE, Pexton C, Harrington, HJ, Gupta P. *Improving Healthcare Quality and Cost with Six Sigma* 1st ed. Upper Saddle River, NJ: FT Press 2006

For your information

If you want a copy of your exam results, please complete and sign a release form while you are visiting the Clinic for your examination. The form is called *Privacy Act Disclosure Authorization and Accounting Record (DAAR)*, or NASA Form 1536.

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